

law of thermodynamics. Born into the world with the usual amount of energy, *i.e.* capacity for work, some minds are so constituted as to transform a large portion of it so that it is of service to humanity, while a comparatively small portion is, as it were, wasted. The sum of the action of such minds constitutes human progress. It is necessary that the progress of the individual genius should be hindered as little as possible by artificial and unnecessary obstacles, and it would appear that in some countries the path is made easier than in others. Taking the membership of national academies as a test, if only a rough one, of scientific eminence, the proportion of distinguished men to the inhabitants, reckoned in millions, is in Saxony 0.2, in Baden and Norway 0.25, in Switzerland 0.33, in Holland and Bavaria 0.41, in England and Prussia 0.49, in France 0.79, in Italy 2.17, in Austria 2.7, in the United States 3.08, and in Russia 16.3; that is, for example, there is in Russia only one member of international academies to 16.3 million inhabitants. It can hardly be doubted that this low number is due to the hindrances which stand in the way of the progress of youths who might, in Russia, display genius, and enrich the world by their efforts.

It is impossible to review such a book as this satisfactorily in a short article. It teems with interest, not only on account of the intrinsic attractiveness of the subject, but also because of the masterly grasp of it displayed by the author. Whatever Prof. Ostwald writes is sure to interest, owing to the originality of his mind and his lucid and attractive method of presentment. On every page there occurs some saying which excites attention, even although the reader may sometimes be disposed to challenge the conclusions drawn. The questions discussed are well worth the most careful consideration of all who have the welfare of humanity at heart. The problem considered is an eminently practical one—perhaps the most practical problem which exists—and we owe the author a debt of gratitude for having introduced it to us in such a charming manner.

W. R.

SOME MEN AND MATTERS IN CHEMISTRY.

Essays, Biographical and Chemical. By Sir William Ramsay, K.C.B., F.R.S. Pp. vii+247. (London: Constable and Co., Ltd., 1908.) Price 7s. 6d. net.

IT is good to read about the pioneers of science, their trials and their triumphs. Even it is good for the student who has to "grind" up facts about scientific worthies and serve them up hot to a voracious examiner; albeit in such a case it smacks strongly of "turning old heroes into unworthy potions," as Sir Thomas Browne remarks in discussing the medicinal virtues of mummies. At any rate, such a student would get some of the facts about his heroes pleasantly enough in reading what Sir William Ramsay has to say in the present volume concerning Boyle and Cavendish, Davy and Graham, Black, Kelvin, and Berthelot.

The essays are a collection of lectures and magazine articles published, the author tells us, at various times during the last twenty-five years. It follows that they are of a popular character in the sense that little or

no special knowledge on the part of the reader is assumed. They are somewhat unequal in scope and treatment, as may be inferred from the fact that the organs in which they first appeared included such diverse publications as the *Youth's Companion* and the *Proceedings of the Royal Society*.

Of the biographical essays, those upon Berthelot and Lord Kelvin seem to the present writer to show the author at his happiest. Perhaps that is because there is the personal note in them; for Sir William Ramsay was acquainted with the French *savant* as well as the English one. He gives us an attractive glimpse of the happy home life of the Berthelots. There was a touch of romance, too, about the meeting of young Marcellin Berthelot with his future wife, which is described in the essay, and which we may venture to quote almost in the author's words. Made-moiselle Breguet was beautiful and well-dowered, but presumably beyond Berthelot's reach. However, one day she was crossing the Pont Neuf in the face of a strong wind, wearing a charming Tuscan hat.

"Behind her walked her future husband; suddenly she turned round to avoid having her hat blown off, and practically ran into his arms. A case of love at first touch," says Sir William.

The stories of Boyle and of Cavendish will always appeal to chemists. The author describes and contrasts the work and character of the two men in an interesting little sketch. "Each was in advance of his age"; Boyle by reason of his calm philosophical spirit and clear judgment, Cavendish in his power of refined quantitative experiments and deductions. Neither was married; and the author, after reflecting that Boyle was too many-sided and Cavendish too reserved, remarks:—"It is perhaps legitimate to draw the conclusion that man's nature does not culminate in its best without the influence of a helpmeet." It may be so; but another conclusion, perhaps equally legitimate, is that if there had been a Mrs. Boyle and a Mrs. Cavendish there might have been no "Sceptical Chymist" and no "Experiments on Air." Black also, it may be noted, remained unmarried, though a particular favourite of the ladies. Perhaps they missed much, these three distinguished chemists, both in personal happiness and in perfection of character; but it may well be that their loss was mankind's gain, and that chemical science has cause to bless the circumstances which enabled them to pursue their researches with singleness of aim, undistracted by either the joys or the troubles of matrimony.

A sketch of the careers of Davy and Graham completes the essay on the "Great London Chemists." Space allows only a brief mention of the author's comparison of the four. Graham, with his philosophical mind, more resembled Boyle than Cavendish or Davy. While Cavendish carried his devotion to science so far that it deprived him of the ordinary pleasures of a human being, and while Davy, in relation to fashion, could not escape the accusation of playing to the gallery, Graham pursued a happy mean, beloved by his friends, esteemed by all. "Of him, as of Faraday, it might have been said with no shade of misgiving, 'He was a good and a true man.'"

The second half of the volume is devoted to essays on various chemical topics. A few titles will indicate their nature; thus there are "The Becquerel Rays," "What is an Element?" "Radium and its Products," and "The Aurora Borealis." This last is an interesting discussion of the evidence for regarding krypton as a noteworthy constituent of the aurora. An oration upon "The Functions of a University," delivered some eight years ago at University College, concludes the work, and ends with the remark:—

"As it exists at present, a University is a technical school for theology, law, medicine, and engineering. It ought to be also a place for the advancement of knowledge, for the training of philosophers, and of those who love wisdom for its own sake. . . ."

Surely; and if examples were wanted of men who loved wisdom for its own sake, who "scorned delights and lived laborious days" in pursuit of it, yet by whose labours was wrought incalculable material benefit to posterity, what better instances could be found than those of the pioneers of chemistry?

With two or three exceptions, neither the biographical nor the chemical essays pretend to be more than popular presentations of their several subjects, and if here and there they seem perhaps a trifle superficial and jejune, it is only fair to remember the circumstances of their production, and to recall the fact that some were written when their distinguished author's powers were less mature, by a quarter of a century's growth, than they are to-day.

C. SIMMONDS.

EXPERIMENTAL PSYCHOLOGY.

A Text-book of Experimental Psychology. By Prof. C. S. Myers. Pp. xvi+432. (London: Edward Arnold, 1909.) Price 8s. 6d. net.

THIS book supplies a want which has been long felt by both students and teachers. Until now there has been no text-book to meet the special needs of those attending a course of instruction in experimental psychology. There have been books on psychology written on an experimental basis which have differed little, if at all, from others not so characterised, and there have been handbooks for the laboratory, notably that of Titchener, but there has been no book which attempted to give in reasonable compass a general account of experimental methods and of the results which have been gained by the experimental movement in psychology. Such a book was needed for two classes of persons, for those definitely committed to the study of the subject, and for the large class of people who know that experimental psychology exists but do not know what it means.

It may be said at once that for each Prof. Myers's book will be of the greatest service. It gives a concise and yet clear account of what has been done by means of experiment in psychology, and it is surprising to find so vast an amount of information in a book of the size. At the same time, there has been admirable judgment in the selection of the material and in the discussion of the many thorny topics in which the science at present abounds. The only fault

to be found is that its conciseness will make it difficult for the beginner, but this has been anticipated by the author, who has distinguished the more difficult parts by means of brackets to indicate that they should be left by the beginner for a second reading. Further, the last eighty pages are devoted to an illustrated description of laboratory exercises, and the performance of these will go far to remove any difficulty due to the conciseness of the main body of the text.

To pass to detail, the earlier chapters are devoted to the senses, and those on hearing are especially full. There is no other book in which a summary of the very important researches of recent years on this subject can be found. The accounts of the psychophysical and statistical methods, given under these titles and in the chapter on identity and difference, are admirably clear, though, perhaps, not enough stress has been laid on the use of the psychophysical methods for purposes other than threshold determination. These methods were devised with the idea that by their means sensation and other psychical states might be measured. They are, however, coming to be used more and more for the exact comparison of the effects of different conditions on mental processes in which there is no question of the actual determination of a threshold, either absolute or differential, and the attention of the student might have been more forcibly directed to this aspect of the use of the methods.

The subject of memory is very fully treated, it might be thought a little out of due proportion. The space devoted to it is, however, fully justified, for we have in this branch of the subject what is, perhaps, the greatest achievement of the experimental method in pure psychology apart from those advances which are rather physiological than psychological.

In a short chapter on muscular and mental work an excellent account is given of modes of research which are now taking a very important place in applied psychology and especially in pedagogy, and the author rightly insists on the difference between the mental work of laboratory methods and that of ordinary life. There is at present a great danger that the value of this line of work will suffer depreciation owing to premature application to practical problems. The last two chapters chiefly serve to show how little the experimental method has so far accomplished in the study of such subjects as attention and feeling.

It is to be regretted that want of space has not allowed the author to deal with the comparative and pathological sides of psychology so far as these can be studied by the methods of experimental psychology. The result of the perusal of this book, in which the accomplishments of the science have been so ably portrayed, is to confirm an impression that the experimental study of the developed mind will not take us very far, and that it is in the study of the developing mind and of the dissociations and destructions produced by disease that there lies the chief prospect of advance. It is to be hoped that the author will be able to deal with these subjects, either in another book or in a future expansion of the present volume.

Although this country has been very late in recognising the experimental movement in psychology, the